blue suns seen in India last September, and they with the great volcanic explosions in Java last August, so destructive of human life!

The said green and blue suns were, however, quite a different phenomenon to our red sunsets. For, instead of appearing extra bright and contrasted in colour with clouds near them, like the crescent moon of December 3 just mentioned, they were abnormally faint, and uniformly tinged with both clouds and fog, and moon and stars at night. Moreover, the spectroscope, in the able hands of Prof. Michie Smith of Madras College, showed that the intervening medium, through which the sun's light was struggling towards these Indian observers, was extra damp instead of extra dry. And in the west of India since then, as we have just heard from private sources, no less than 140 inches of rain have fallen, and the country was in a temporarily impassable condition from sloppy softness of soil.

Prof. Michie Smith has indeed entertained the idea that the particular state of the watery vapour which cut off so largely the red, but passed on the green light of the sun's spectrum in a weakened condition, may have been owing in some degree to particles of pumice dust from the Javan volcanoes. And such dust, once up in the air, may circulate around the earth, after the manner which Commander Maury, U.S.N., was so earnest in teaching with respect to the trade winds and their spiral paths through either hemisphere.

But how long such dust would remain suspended, how high it would rise, and when and where it would fall, are questions that can hardly be answered positively and with exactitude *a priori*. It did not fall, so far as we have heard, in India, where, if present at all, it must have been comparatively low and dense. And it was not falling here during the recent red sunsets, for the lower air was particularly clear, while the supposed criminating redness was too manifestly due to the extraordinary height, as well set forth by Prof. Helmholtz, of the uppermost cloud stratum, a thin kind of cirrus haze, according to my observation, combined with the discriminating action of the atmosphere on the compound coloured solar light.

Why that cloudhaze was so high, and whether dust, and if so what dust, had any part in its constitution, are questions which may worthily be discussed, but no very certain answers expected for years to come. But having been myself much struck during a rather long residence on the Peak of Teneriffe in 1856, with the general and apparently normal existence of dust strata in the atmosphere, higher or lower, but often far above the level of ordinary water-vapour clouds,—and as the meteoric researches of Prof. Newton, corroborated by Prof. C. A. Young, in America, show that not less than 100 tons of meteoric stones (of which the earth encounters nearly 3,000,000,000 in the course of a year) must be dissipated in our upper atmosphere on the average *every day*, as impalpable dust,—it seems more probable that Prof. Helmholtz's very high clouds, if they were assisted in putting in an appearance as clouds by dust of any kind, must have derived it from such disintegrated and sublimed meteor-masses coming down day by day in the regular way of nature from above, or outside, rather than from a supposed continued ascent of one particular charge of volcanic dust from Java, full three months after the cessation of all violent disturbance there.

In fact while it is to be earnestly hoped, as an outcome of the late remarkable sunsets, and the great numbers of the public by whom they have been witnessed,—that our painters will no longer be content to give us so generally mere afternoon pictures slightly yellow ochred and "light red"-ed near the horizon before the sun goes down, as sunsets,—but will more frequently paint the deep red afterglows at their richest;—it is equally desirable that our scientists should gauge the ordinary constitution of the atmosphere at much greater heights than those to which observatories are usually confined.

C. PIAZZI SMYTH,
Astronomer Royal for Scotland

15, Royal Terrace, Edinburgh, 12 December 8

THE following summary of atmospheric effects seen before sunrise and after sunset between November 25 and December 11 may be useful for comparison with phenomena observed in other parts of the world:—

November 24.—After sunset, yellowish-green striæ in west.

November 25.—Sunset in amorphous apparent cirro-stratus or cirrus haze. Green light above it, and bright greenish-white arc growing from about ten minutes after sunset; above the greenish-white, pale red. Lasted about forty-five minutes after sunset. The sky shone with a strange light somewhat as on November 9, but much feebler, and there was no sharply marked aggregation of cloudy reflecting material as then.

November 26.—Fine clear sunset, followed by phenomena like yesterday, but much stronger, and lasting nearly an hour bright red. No high clouds seen as light receded from the sky. A few rounded morsels of cumulus fringed with green against the red sky. Very strange effect, the greenish-white light in the west, and pink above.

November 27.—Sunset effect like yesterday, beginning to glow about fifteen minutes after sunset, and growing slowly in apparent brightness. Lasted till about 5.20. Slight, thin cirrus.

November 28.—Slight cirrus. Clear sunset. About twenty-five minutes after sunset green and pink glow began and grew bright and finely-coloured till about 4.40. Then slowly receded till about 5.10, when it disappeared, and was succeeded by a faint brass-coloured after-glow reaching high above the horizon. Time of sunset, 3.55.

November 29.—Extraordinary red glow, said to be seen in London from 5.30 to 7.30 a.m. Cloudy evening. At 4 55 a dull faint red glow observed through a small break in the clouds. Time of sunrise, 7 43.

November 30.—At 6.5 a.m. (and probably a few minutes before) a fine deep red glow in the east and overhead, where small quantities of cirro-cumuli seemed to be touched by the reflected light. At 6.15 a faint, deep red glow had spread from north-north-east to south-east, and up to about 40° above the horizon in the north-east, covering a vast portion of the sky. Then gradually became whiter and less striking. The blood-red band in darkness at 6.10 most remarkable. The glow continued (slowly changing in colour and growing in extent), and was evidently independent of ordinary clouds. The bright stars appeared through it. At 6.24 a faint red light extended to the zenith. At 6.40 the red had gone, and was replaced by a primrose colour, the flocks of cirro-cumuli, however, still remaining tipped with bright red, and retaining that colour till sunrise (7.44). There was no cirrus visible, and the reflecting haze was invisible both by night and in full daylight. The cirro-cumulus was moving moderately fast from west-north-west. The red bank in the east was not crowned with shafts of rays or prominences as in the sunsets of November 26, 27, and 28, but the intensity of the light diminished continuously upwards from near the horizon. The afternoon being cloudy, the only thing observed was a dull greenish light about half an hour after sunset.

December 1.—Sunrise cloudy. Sunset (3.53) in cloudy sky, except near horizon. At 4.25 slight tinge appeared on fringes of clouds overhead. Then densely clouded. At 5 the sky had cleared largely, and a fine amber light could now be seen from near the west horizon to about 40°. This gradually sank, following the sun, and grew less bright, finally disappearing about 5.35. Sky clear and starlight, except low strips of cloud near the horizon.